

Ecological Observations on Colorado Myxomycetes

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Five years of intensive collecting of myxomycetes in north-eastern Colorado have impressed upon the writer certain features of the distribution and behavior of these interesting organisms. Here, as elsewhere, the factors limiting occurrence are the available supply of water and of decaying vegetable matter, but these factors have certain peculiar features in the region considered and affect not only the distribution but also the behavior.

While Colorado is described as "semi-arid" and the reported occurrence of one hundred and twenty-five species of Myxomycetes may cause initial surprise, this is dissipated when local conditions are known. While the plains just outside the foothills, with an average elevation of 5,000 feet, have an annual rainfall of approximately fifteen inches, a station in Estes Park at an elevation of 8,000 feet has an annual rainfall of twenty-three inches, while Palisade Lake, elevation 10,000 feet, has forty-eight inches. Even more significant is the fact that in a given locality more than 50 percent of the annual precipitation frequently occurs within a period of three months.

But adequate rainfall does not necessarily furnish the right conditions for the growth of myxomycetes, this being only one of the factors concerned. The supply of moisture must be continuous through a considerable period of time, and decaying vegetable matter must be present. In the mountains, where the rainfall is greatest, the ability of the soil to retain moisture is determined by the slope of the ground, the exposure, and the forest cover. The optimum conditions are found in this district at scattered stations at elevations from 8,000 feet to 9,000 feet on old glacial melting plains where beaver-dams have helped to create wooded swamps, or on wooded hillsides kept moist by seepage from springs, beaver-ponds or melting snows. Precisely these locations also provide the decaying vegetable matter which is the second desideratum. This is an important point, for even in the mountains, acres of down timber frequently fail to yield a single log with the type of decay favorable to the presence of myxomycetes.

Again, these mountain districts support a limited number of tree species—three pines, two spruces, Douglas and subalpine firs, aspens, cottonwoods, box elders and alders. This affects both the

distribution and the kinds of slime-molds which occur. Some species are very adaptable, while others are found only on a few species of wood. In general, certain species are found on conifers, and certain other species on the broad-leaved trees. *Badhamias* show a distinct preference for aspens and cottonwoods, while the *cribrarias* are found mostly on conifers.

Certain species occur on decaying logs on steep, relatively dry hillsides. Several species of *Cribraria* and *Arcyria*, and *Stemonitis fusca* and *Comatricha nigra* are frequently found in such places. These forms secure their moisture from melting snow, and apparently thrive at a lower temperature than most species. In these locations the sporangia appear in connection with a definite type and stage of decay. They have usually been found on logs of some size, where fungi have destroyed the lignin of the cell walls. So far no sporophores of these fungi have been observed and the causative organism is still in doubt.

Certain aethalial forms—*Lycogala flavo-fuscum* and *Mucilago spongiosa* var. *solida*—have been found in situations which require a different explanation. These occurred on the trunks of street trees in Fort Collins, the former on living, the latter on dead, but still standing trunks of cottonwoods. These aethalia were from two to ten feet above the ground. In both the dead and living trees heart-rot had made considerable progress. Observation showed conclusively that the plasmodium found both its food and the necessary supply of moisture in this heart-rot, emerging from cracks in the bark to form the aethalia.

Evaporation from all exposed moist surfaces is very rapid throughout the district. This results in a further limitation of occurrence, and in frequent arrested development at various stages of the cycle. In most cases the length of the plasmodial stage is shortened and the colonies in all but exceptional cases are small. The exceptions noted were largely colonies of *Badhamia magna* and *Trichia decipiens*, in a season when almost daily rains in a particular locality continued for several weeks, checking the evaporation in a marked degree. This shortening of the plasmodial stage is also evidenced by the frequent occurrence of small sclerotia and the very rare occurrence of larger ones. Rather frequently one meets with half-formed sporangia and aethalia. These sporangia have the usual shape for the species, but are still connected by plasmodial strands, the whole complex retaining the color of the plasmodium, but having the texture of

sclerotia. The aethalia likewise retain the color of the plasmodium, but have the texture of dried glue and are somewhat wrinkled, like dried prunes. And when the sporangia are fully formed, occasionally one finds evidence of arrest in the presence of small immature spores and giant spores, four or five times the size of normal spores.

Besides these arrested developments, the rapid evaporation seems to be responsible for the unusual position of the sporangia of many species. Except for the aethalial species already mentioned and one collection of *Physarum didermoides* var. *lividum*, all specimens collected, representing some eighty species, were found on the under side of the support to which they were attached. While this is a normal position for some species, it is quite unusual for others. This position, often in actual contact with the soil, makes the organisms peculiarly liable to attack by molds. This is noted in superficial growths upon the sporangia at the time of collection and in the appearance of mold spores carried up into the sporangium by the rising plasmodium. When sclerotia are reanimated in the laboratory, these molds, which are peculiar to the forest and are not the forms usually seen in the laboratory, often get the start of the plasmodium and prevent further development.

SUMMARY.—In the district investigated the occurrence of myxomycetes is strictly limited by the continuance of an available supply of water through a definite minimum period. The optimum conditions for their occurrence are found in mountain valleys and wet wooded hillsides at elevations of 8,000 to 9,000 ft.

There is some restriction in the occurrence of species due to the limited number of tree species in the area.

Certain species are found in drier locations where a definite type and degree of decay is present in fallen logs of conifers. Certain aethalial species found in dry locations get their food and moisture from dead or living trees affected by heart-rot.

The rapid evaporation from all exposed moist surfaces leads to arrested development at various stages of the life cycle, to unusual position of sporangia and consequent extreme susceptibility to attack by molds at various stages of their development.

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